

## PART III

## Physical Description

Physical Regions of Washington

On the basis of surface features, Washington may be divided into eight general regions. Agricultural settlement is influenced by factors of topography, climate, soil, forest vegetation and water resources distinctive to each of the physiographic regions. Each has become a different type of farming area as settlers have learned to adapt crops and livestock to the conditions, or have improved limitations through drainage or irrigation.

Coastal Plains

A narrow, sandy plain with shallow bays, tidal flats, stream deltas and low headlands lies between the coastline and the Coast Range. It extends from the Columbia River mouth almost to Cape Flattery, being widest and lowest in the Grays Harbor and Willapa Bay districts. The climate is mild and damp with a long growing season, but it is too cool, cloudy and wet for most crops. Originally this area was covered with heavy forests and much is now covered with woodlands. Lumbering and manufacture of wood products is the main industry. Farming is largely of the livestock and dairying type on low uplands and drained areas in the lower Chehalis River Valley. Cranberry growing is important and well-adapted to numerous, boggy areas in the Grays Harbor and Willapa Bay sections. The shallow bays are also used for oyster culture. Fishing is common in the rivers and coastal banks.

Coast Range

The Coast Range is an uplifted area of sedimentary and metamorphic rocks divided into the Olympic Mountains and the Willapa Hills. The Olympics tower to nearly 8,000 feet in a dome-like structure, carved deeply by rivers. These mountains have the heaviest precipitation in the state. Snowfields and heavy forest cover the mountains. Most of the wilderness area is within the Olympic National Forest and Olympic National Park, being managed for recreation, wildlife and timber. Farm settlement is limited to some foothill river plains and coastal terraces such as the Dungeness and Port Angeles districts along the Strait of Juan De Fuca. Here in the lee of the mountains, rainfall is moderate and irrigation is practiced by some livestock farmers. The Willapa Hill country is wet, heavily forested and carved into numerous narrow valleys. Logging is the main industry, combined with livestock farming in the upper Chehalis River Valley and along the banks of the Columbia River. Wet climate, hilly topography and the difficulty of clearing stump land retards agriculture.

Willamette-Puget Sound Lowland

A broad lowland, described as a trough or valley, lies between the Coast Range and the Cascade Mountains. The northern part is the Puget Sound Lowland which has been glaciated and occupied by the sea in the lowest section. The continental glacier reached slightly south of Olympia. Under a warming climate it melted and geologists believe it receded about 25,000 years ago, leaving an infertile plain of moraines and outwash gravels, sands and clays known today

as the Puget Glacial Drift Plain. Its rolling surface has numerous lakes and bogs. Most of the major cities--Seattle, Tacoma, Everett, Bellingham and Olympia--have been built on moraines bordering the Sound. Rivers, such as the Nooksack, Skagit, Snoqualmie, White and Puyallup, built up deltas and flood plains over the older gravelly plains. These narrow valleys are more fertile than the older glacial plains and support numerous small dairy, vegetable and berry farms. Most of the gravelly areas are wooded with a second-growth forest and are used for pastures. In the southern part of the Willamette-Puget Sound Lowland, there are two large valleys--the Cowlitz and Chehalis. They drain a low, hilly area with several flat prairies and bottom lands.

Agriculture is handicapped by poor drainage and flooding of the river deltas and plains, by heavy winter rainfall, by cloudy but dry summers, by coarse, gravelly upland soils and by densely wooded land which is costly to clear. Advantages are mild climate and a location close to major markets for farm products such as milk, poultry and vegetables.

### Cascade Mountains

The Cascades are a wide and high topographic and climatic barrier which separates western and eastern Washington. The range is made up of sedimentary, igneous and metamorphic rocks which have been carved by glaciers and streams. High, isolated volcanic cones of lava such as Mt. Adams (12,307 feet), Mt. Rainier (14,408 feet) and Mt. Baker (10,791 feet) appear upon the older Cascade rocks. The Cascade crest varies between 3,000 and 10,000 feet and is higher and more rugged in northern Washington. Roads and railroads have been built across its lower passes in central and southern Washington. The Columbia River has cut a deep gorge and the lowest pass through the barrier. The western slope is wet and heavily forested with Douglas fir. The eastern slope is drier with a less-dense pine forest. Nearly all classified as forest land, most of the area is in Federal ownership in five national forests and Mount Rainier National Park. Tree fruit farming in the eastern slope valleys of Wenatchee, Chelan, Methow, Naches and the Columbia Gorge is most important. Sheep and cattle summer grazing on alpine grasslands is another use. Deep western slope valley bottoms such as the Skagit, Snoqualmie, Nisqually, Cowlitz and Lewis also contain livestock farms. The area is vitally important as a source of timber. Steep terrain, wet climate, short growing seasons and heavy forest vegetation are main handicaps for agriculture.

### Columbia Basin

A low plateau of old lava rocks covered with stream and wind-deposited soils extends in a series of plains, ridges, coulees and hilly from the Cascades to the eastern Washington border. The area is basin-like in structure, being higher around its margins and sloping inward to low and level central plains. It has been sharply eroded by the Columbia River and its interior tributaries, the Snake, Yakima, Palouse and Spokane Rivers. The basin has sub-areas created by crustal movements and erosion.

The Yakima Folds are a series of hilly ridges extending from the Cascades eastward into the lower part of the basin. The Yakima and Columbia Rivers have cut gaps through the ridges and built up plains in the troughs between them. The rich, alluvial plain of the Yakima River is an important irrigated valley.

The Waterville Plateau is a tableland of thin soils overlaying basaltic rock at an elevation of 2,500 to 3,000 feet. It has gorges cut by the Columbia River and ancient glacial outwash streams once flowing in Moses and Grand Coulees. It is too high for irrigation and is used for dryland grain and livestock farming. The high plain is often called the Big Bend country.

The Channelled Scablands is a belt of dry terrain carved by ice-age rivers into a series of coulees. Bare rock is exposed in the coulees. Small plateaus between the old river channels have thin soils used for dryland farming. The Grand Coulee of this region has been developed into a major irrigation reservoir.

The Palouse Hills consist of fertile deposits of wind-blown soil overlaying basaltic lava flows. After being deposited in large dunes, the formation was reshaped by streams into an intricate pattern of low, rounded hills which are tilled for wheat, barley and legumes. The hills receive 16 to 25 inches of rainfall and have deep, porous and fertile soils. It is one of the richest farming areas of the Pacific Northwest.

The Central Plains are low and relatively level expanses of soil, deposited by old streams crossing the Channelled Scablands and later by the flooding of the Yakima, Columbia, Snake and Walla Walla Rivers. Climate is desert-like (6-12 inches of precipitation per year). The lower lands of the area, the Quincy and Pasco Basins and the Walla Walla Valley, are irrigated. Quincy Basin is a new irrigation area watered by Grand Coulee Dam.

Agricultural handicaps in Columbia Basin regions are mainly found in its dry, continental climate. Large irrigation systems built since 1900 have overcome much of the need for water on rich valley and basin soils. Dryland farming in higher areas is practiced widely, although occasional variations in rainfall, lack of snowfall, winter-kill, water and wind erosion inflict damage to field crops and to livestock ranges.

### Okanogan Highlands

A portion of the Rocky Mountains, consisting of well-eroded old granites, lavas and sedimentary rocks, extends across north central Washington. These are the Okanogan Highlands, the state's richest mineral area. Summit levels reach 4,000 to 5,000 feet with peaks exceeding 7,000 feet. Prominent north-south valleys are occupied by irrigated tree fruit and livestock farms. These are the Okanogan, Sanpoil, Kettle and Colville Valleys. The Columbia River gorge through the Okanogan Highlands is occupied by the large man-made lake behind Grand Coulee Dam--Roosevelt Lake. High and water portions are forested with pine and larch, and are managed for timber and for livestock ranges by the United States Forest Service and the Bureau of Indian Affairs. Cold winter temperatures, short growing seasons, dry valley climates and distance from markets are farming handicaps.

### Selkirk Mountains

The Selkirks, a range of the Rocky Mountain system, extend into the northeast corner of Washington. The rocks are old mineralized granites and metamorphics reaching elevations of over 7,000 feet. The Pend Oreille River Valley

at the base of the Selkirks is an agricultural area of narrow bottom lands settled by livestock farmers. Nearly all of the uplands are in Kaniksu National Forest. While climate is cool and growing seasons are short, the Pend Oreille Valley has an advantage of being closely located to the Spokane metropolitan market area.

### Blue Mountains

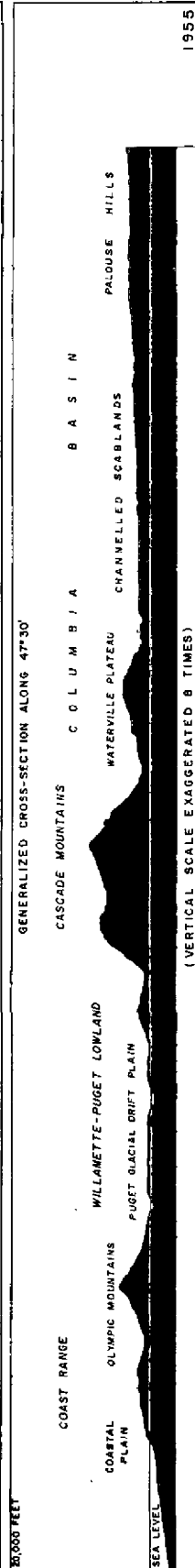
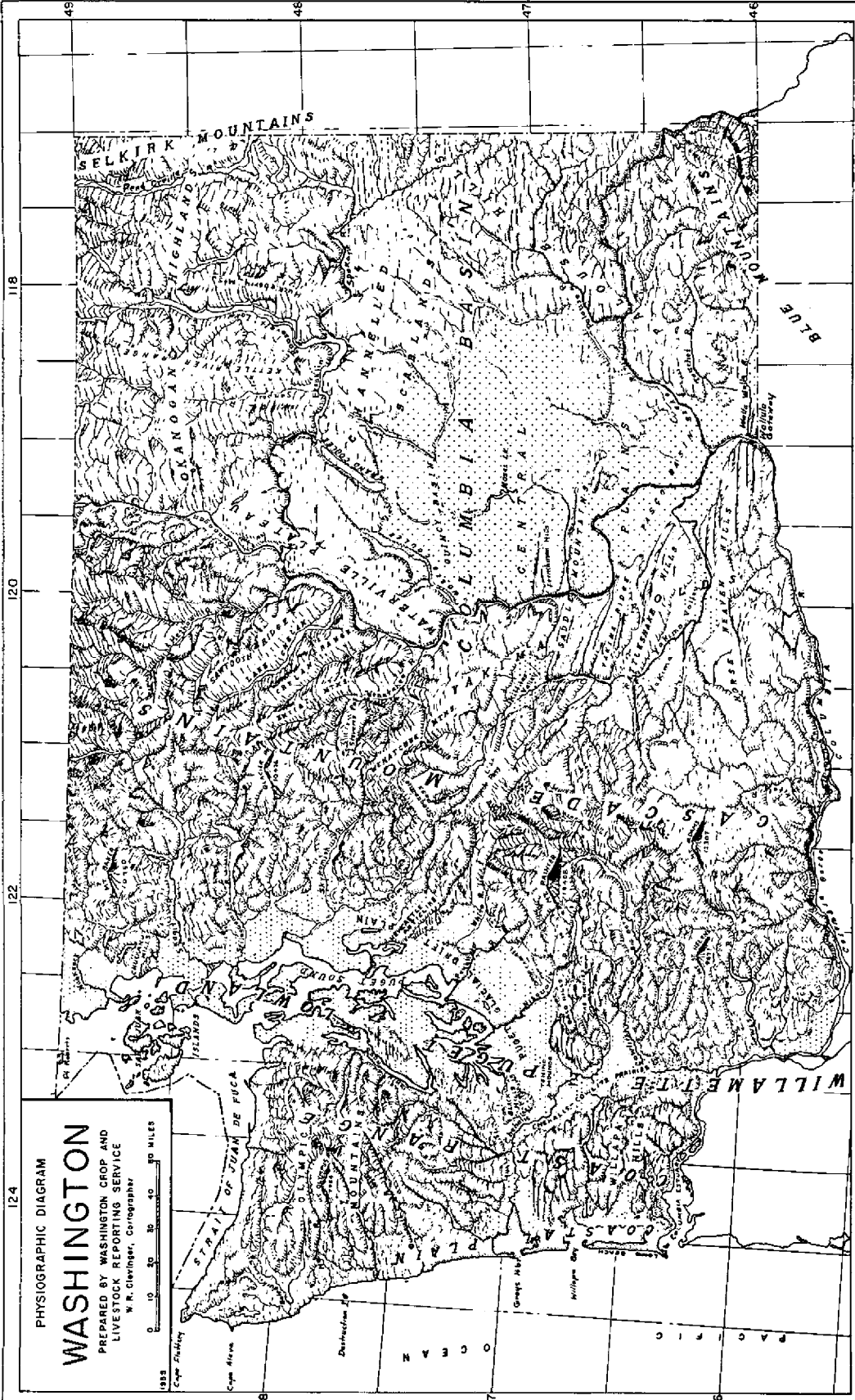
The Blue Mountains are an uplifted and eroded plateau extending into the southeastern corner of Washington. The strata are mainly ancient crystalline rocks which contain some minerals. The highest point of the mountains in the Washington section is Diamond Peak (6,401 feet), on the divide between the Grande Ronde, Tucannon and Touchet Rivers. These rivers, and the Walla Walla River, have cut valleys into the plateau. Extensive pine forest and grassland areas are in the highlands within Umatilla National Forest, where rainfall is 30 to 40 inches. The Snake River has cut a deep valley and gorge across the lower parts of the mountains. The area is well developed agriculturally around its northern foothills where wind-blown soils are deep and irrigation systems are used. The Walla Walla and Tucannon Valleys are rich grain, legume and livestock areas grown under irrigation and by dry farming. Grazing is an important use of the high lands by livestock ranchers in the upper valleys.

### Topography of Okanogan County

Okanogan County is predominantly a mountainous area. Actually, the county includes parts of three features recognized in Washington State physiography. The western part includes a rugged section of the Cascade Mountains, deeply cut by the Methow River. A section of the basaltic Waterville Plateau is in the south central section. The eastern section is the older, less-rugged Okanogan Highlands, drained by the Okanogan River. Its southern border is the gorge-like canyon of the Columbia River, which dissects the layers of basaltic rock of the Waterville Plateau.

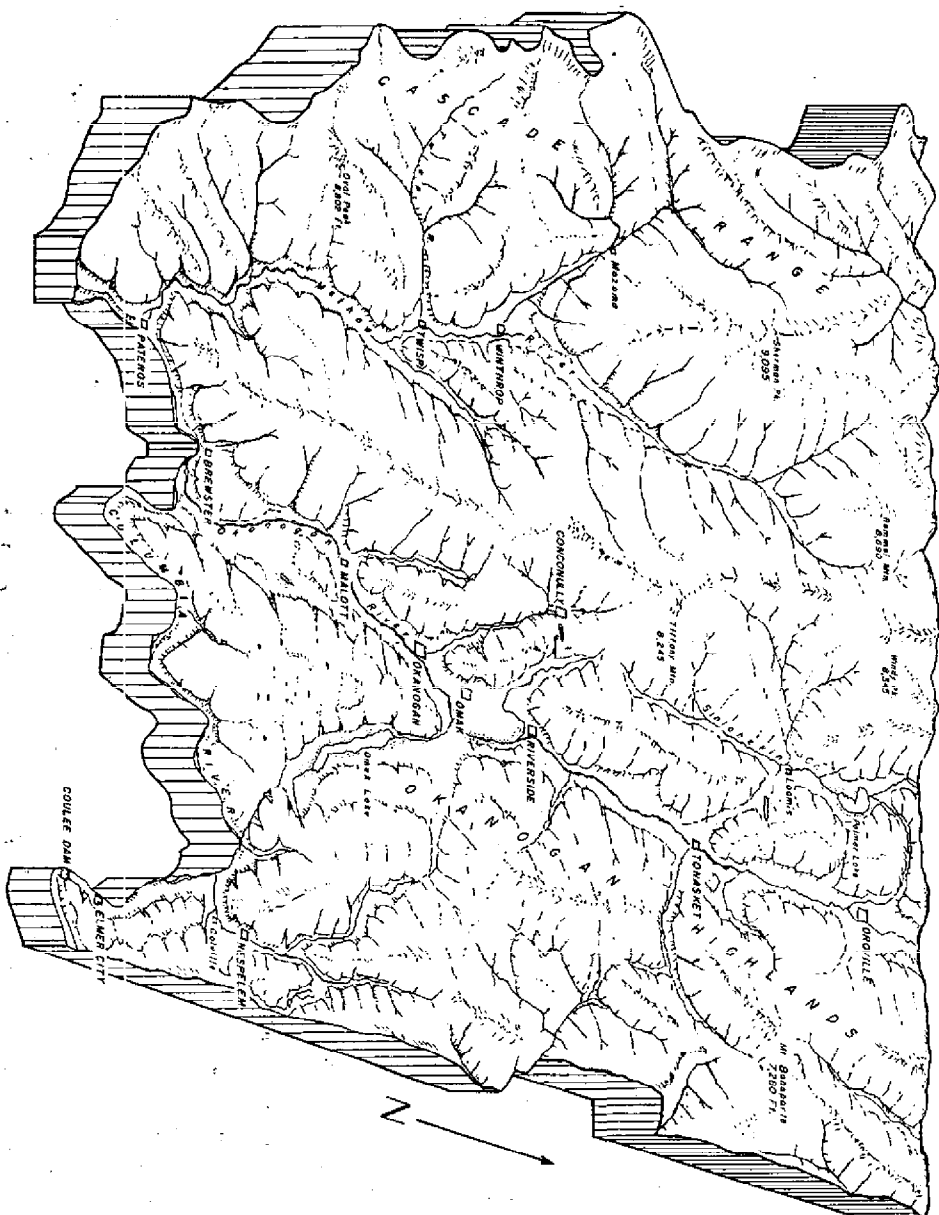
The county shows the results of glaciation in the mountains of the Cascade section and in the former glacial valleys of Methow and Okanogan. The valleys are filled with deep layers of old glacial material. Flat terraces such as Pogue Flat above the rivers are distinctive remnants of former river flood plains left as the Columbia, Okanogan and Methow Rivers have cut deeper into the strata.

Elevations range from about 700 feet above sea level along the Columbia River to 8,970 feet on the summit of North Gardner Mountain in the Cascades. This is the highest point in the county. Mount Bonaparte, 7,280 feet, is the highest point in the Okanogan Highlands. The Okanogan Valley has a gentle gradient from north to south, being largely under 1,000 feet. The Okanogan River is navigable by boats from its mouth to Riverside. The deep trench of the Okanogan River was the historic "Cariboo Trail" of fur traders, a natural trailway or cross-mountain route connecting the major basins of the Columbia and Fraser Rivers. Today it is traversed by a railway and highway which connect north central Washington with British Columbia, Canada.



# TOPOGRAPHIC DIAGRAM OKANOGAN COUNTY

SCALE OF MILES  
0 10 20



WASHINGTON ZONOP AND LIVESTOCK REPORTING SERVICE

W. M. CLEVERLEY

### Land Classification and Soils

Okanogan County is divided into seven broad classes of land use capability. 1/ Class I and II land described as very good and good land for farming is very limited (see Figure 5). There is only one district of Class II land. It surrounds Lake Osoyoos and includes the upper Okanogan river bottom between Oroville and Tonasket. Class III and IV land is moderately good to fairly good land. It is found on the terraces and benchlands of the lower elevations along the Okanogan and Methow Valleys and along the banks of the Columbia River and in such districts as Pogue Flats in the Omak-Okanogan area. It includes the lower bottomlands and benchlands around Lake Palmer, and a large plateau area of Class IV land surrounds Muskrat Lake and the Chesaw-Molson district. Mountainous forested land of classes VI, VII and VIII makes up about 80 percent of the county.

The best soils are the alluviums (clay, silty and sandy loams) deposited along the rivers and in old lake beds. The soils are slightly alkaline and are light brown in color because of a deficiency of organic matter. Upland soils are dry and ground water tables are deep. Bottom land soils are underlain with deep layers of gravel, sand and clay deposited during glacial time.

### Climate

Climatic conditions vary considerably from locality to locality because of the mountainous topography. With the exception of the Cascade Mountain section in its western portion, most of Okanogan has the dry continental climate which extends from the Cascade Ranges eastward to the humid continental lands of midwestern United States. This climate is characterized by cold winters with considerable snow, and hot, dry summers. The Okanogan area is also affected by a plateau or mountainous variation of the continental climate. It has more extreme winter temperatures and more varied patterns of precipitation than plains areas.

Weather Bureau data are limited to a few locations, but give a general pattern by which precipitation can be charted and temperature conditions estimated. Because of variations in elevation and exposure to prevailing westerly winds, temperatures, frost conditions and precipitation vary sharply within short distances.

Precipitation varies from over 70 inches on the east slope of the Cascades to about 10 inches in the Okanogan River bottom lands. The prevailing westerlies drop moisture in the Cascades and as they descend the slopes they become warm and absorb moisture rather than giving it. The eastern half of the county is dry, and the low stations on the river bottoms such as Brewster, Omak, Oroville, Okanogan and Winthrop only receive 10 to 14 inches per year. There is a seasonal pattern of precipitation. Snow storms of the November-to-March period bring more precipitation than the spring-autumn rains and the summer

-----  
1/ Washington Agric. Experiment Stations, U.S.D.A. Soil Conservation Service. Bulletin No. 200, Dec. 1950. Land Capability Methods for Conserving Washington Soils.

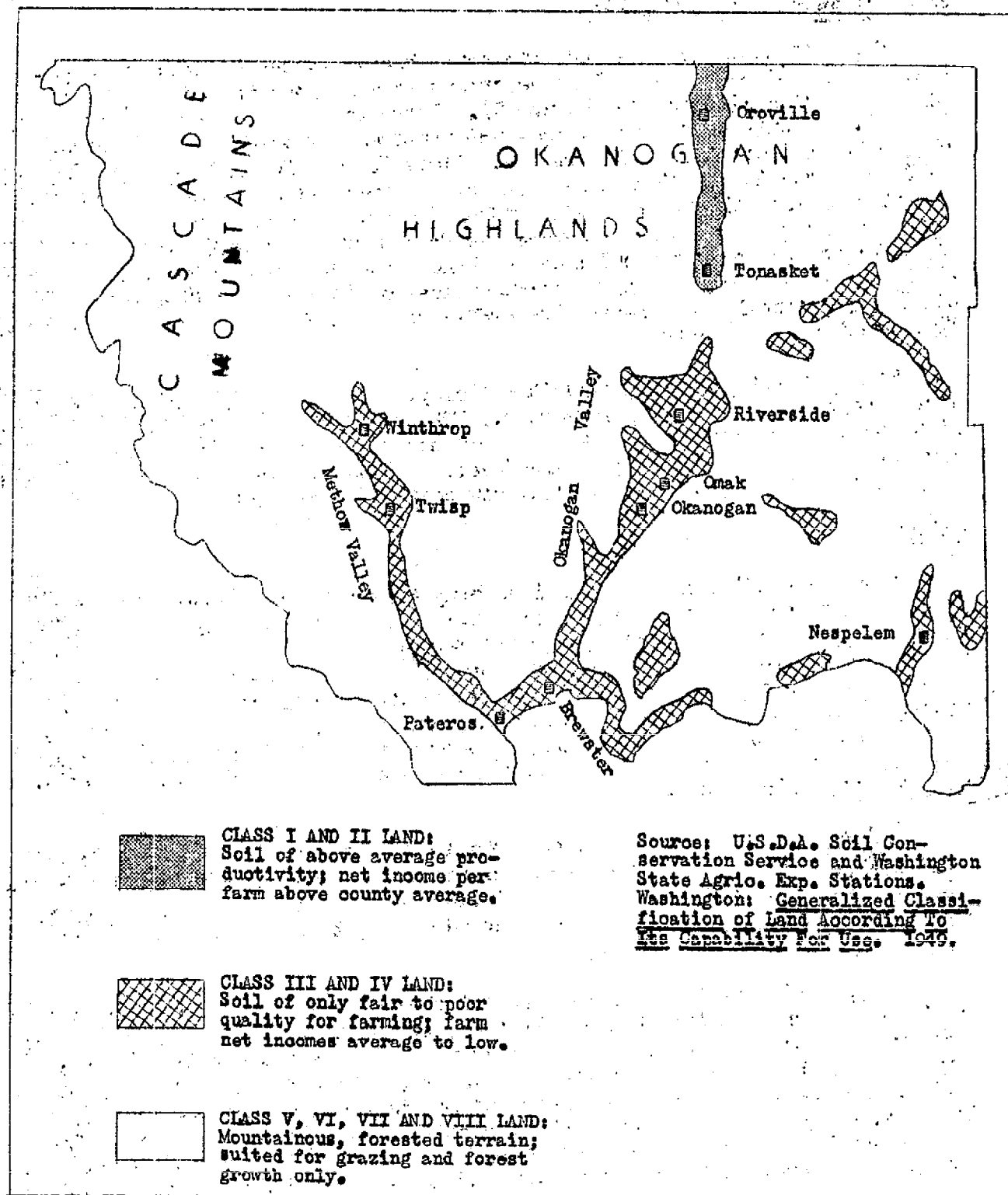


Figure 5.- General Quality of Land in Okanogan County

thundershowers. Evaporation is rapid during the summer; rains of this season are not effective in supplying soil moisture. Because of the low precipitation and scant soil moisture in the valley bottom lands, irrigation is necessary to assure good growth of tree and field crops.

Temperature records of over 20 to 35 years duration at seven stations show that winter temperatures are severe. Brewster is the warmest location in winter with a January average of about 28 degrees; Winthrop, in the upper Methow, is the coldest farming locality with a January average of 18. Extreme cold temperatures of 23 and 31 below zero degrees have been recorded at Brewster and Winthrop.

Summer temperatures are warm during the days and comfortable cool at night. Okanogan is the warmest locality with a July average of 74.6 degrees. The higher localities, Chesaw, Conconully and Winthrop, are cooler having daily maximum temperature averages of 69.5, 66.6 and 69.4 degrees. Extreme summer maximum temperatures of 110 and 111 degrees have been recorded in the Okanogan and Methow valleys.

Growing seasons and frost conditions normally are favorable for crop growth. At Brewster and Okanogan the growing season is usually 180 days. At Winthrop, Oroville, Nespelen and Conconully late spring and early-fall frosts are frequent, and the growth season normally is less than 150 days. The mountain and valley topography creates frost pockets in low areas where air circulation is poor. Most orchards are on terraces and slopes, located to avoid frost pockets.

Table 6.- Temperature Extremes, Dates of Killing Frost  
Okanogan County

Station and Elevation in Feet	Temperature Extremes Recorded (degrees Fahrenheit)		Killing Frost Average Dates	
	Coldest	Hottest	Last in Spring	First in Fall
Brewster	-23	110	April 17	October 12
Chesaw (2,900)	-27	101	June 8	September 10
Conconully (2,270)	-29	109	May 19	September 26
Nespelen (1,872)	-28	106	May 14	September 25
Omak (1,228)	-23	114	May 7	October 3
Oroville (1,060)	-19	111	May 1	October 5
Winthrop (1,755)	-31	110	May 18	September 26

Source: U.S. Weather Bureau, Climatological Data,  
Washington 1956

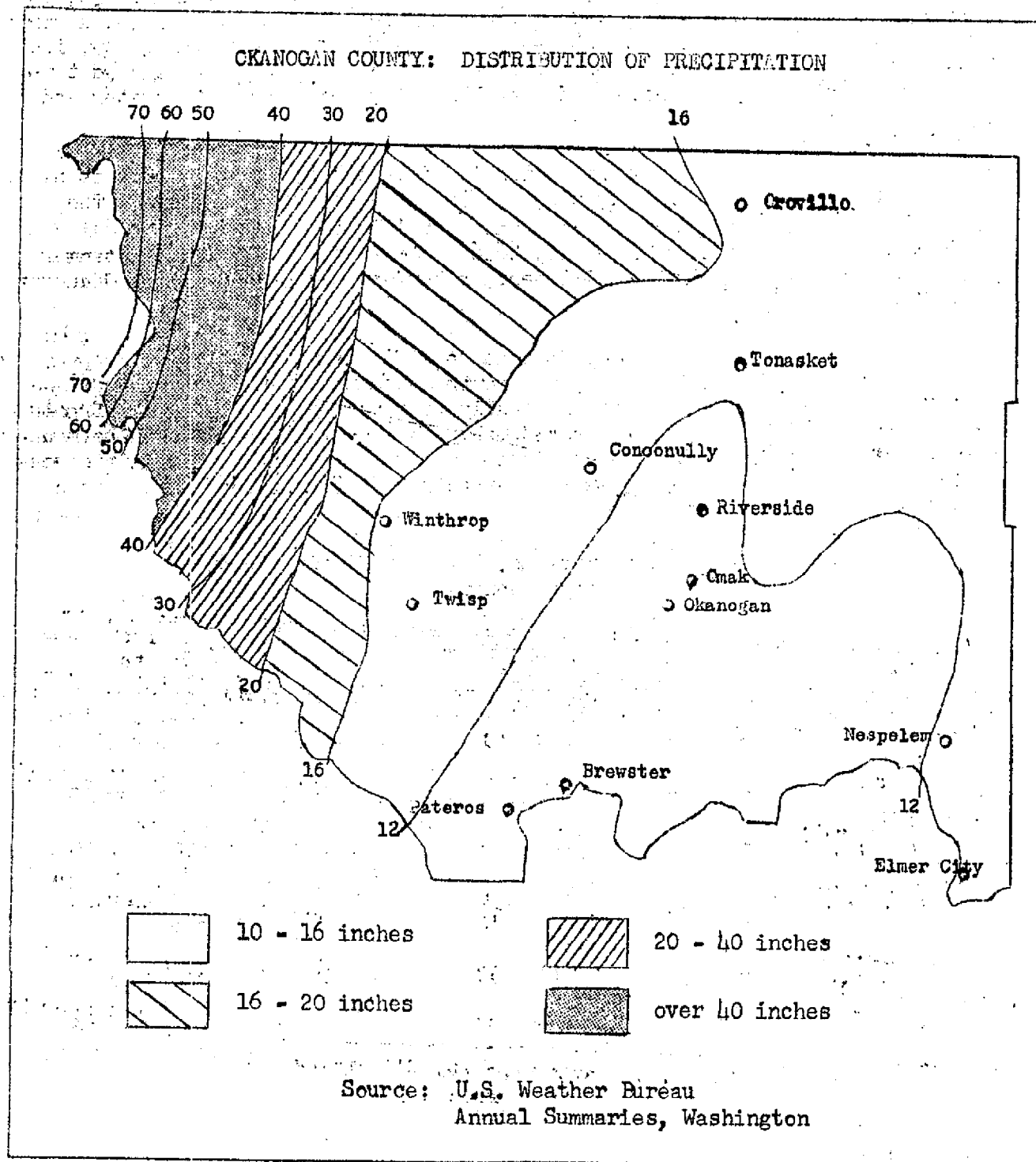


Figure 6.- Distribution of Precipitation  
Okanogan County

Table 7.-- Temperatures For Selected Stations, By Months  
Okanogan County

Station and Elevation in Feet	Average Temperatures (in degrees Fahrenheit)												Annual Average
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Chesaw (2,900)	19.8	36.6	33.8	44.8	53.1	57.4	64.6	63.4	55.6	44.2	45.8	26.0	42.6
Conconully (2,270)	20.8	35.2	36.3	46.2	55.8	59.8	66.8	65.8	57.0	46.4	46.8	27.5	44.7
Omak (1,228)	22.6	42.7	39.8	49.9	58.4	64.8	71.1	68.5	60.6	47.8	47.7	31.1	47.4
Winthrop (1,755)	18.0	35.1	36.3	48.1	55.0	61.9	69.4	68.0	58.3	48.0	46.2	22.6	45.3

Source: U.S. Weather Bureau, Climatological Data,  
Washington 1956

### Forests and Wildlife

About two-thirds of Okanogan County is classified as forest land according to surveys of the U.S. Forest Service. In 1937 this service estimated that forest land included 2,235,455 acres with a commercial saw timber volume of 9,143,000,000 board feet. The survey estimated the acreage of leading lumber and wood species. It included 226,000 acres of Douglas fir and 27,000 acres of western hemlock in the Cascade Mountain section. In the drier, mountainous areas there were 268,000 acres of ponderosa pine, 94,000 of true firs and other alpine conifers, 30,000 acres of larch and 25,000 acres of lodge pole and white pine.

The Federal Government manages 2,125,629 acres of land in Okanogan County, over three-fifths of its total area. There are 1,520,339 acres of forest and range land in Chelan and Colville National Forests, 497,157 acres in the Colville Indian Reservation and 108,133 acres in other federal public domain. The Federal and Indian lands contribute to the county economy through sales of timber, granting of grazing permits and use for hunting and recreation. State and county ownership of forest land amounts to 221,085 acres. Private ownership by lumber companies and farmers includes 272,050 forested acres.

Both the public and private forest resources are valuable as supplemental sources of income for farmers living in the valleys. Seasonal employment is found in the ponderosa pine logging and lumber industry centered around Omak, Tonasket, Oroville and Twisp and about 60 million board feet of lumber are produced per year. The area is noted for production of box shoo used in the local fruit industry. In 1954 Okanogan County was 12th in the state in logs cut with a forest harvest of 123,335,000 board feet. Farm wood lots yielded products worth \$165,000 in 1954.

Statistics reported by the Washington Game Department show that Okanogan County is a leading area for big game hunting. In 1955, 12,600 deer were killed by sportsmen, being the largest number in any Washington county. Hunting, together with fishing by numerous sportsmen, creates some income for farmers and ranchers who provide packing and guiding services.

Wild fur bearer trapping is another source of income. In the 1951-52 season a harvest of 2,155 muskrat, 150 mink, 117 marten and 48 ermine was trapped in Okanogan forests, along streams and in marshlands.